

Phase space analysis of the accelerating multifluid Universe

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Abstract

© 2017 American Physical Society. We study in detail the phase space of a Friedmann-Robertson-Walker universe filled with various cosmological fluids that may or may not interact. We use various expressions for the equation of state, and we analyze the physical significance of the resulting fixed points. In addition, we discuss the effects of the stability or an instability of some fixed points. Moreover, we study an interesting phenomenological scenario for which there is an oscillating interaction between the dark energy and dark matter fluid. As we demonstrate, in the context of the model we use, at early times the interaction is negligible, and it starts to grow as the cosmic time approaches the late-time era. Also the cosmological dynamical system is split into two distinct dynamical systems that have two distinct de Sitter fixed points, with the early-time de Sitter point being unstable. This framework gives an explicit example of the unification of the early-time with late-time acceleration. Finally, we discuss in some detail the physical interpretation of the various models we present in this work.

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